

ORIGINAL STUDY

Regional Necrotizing Fasciitis and its Outcome

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Abstract:

Necrotizing fasciitis, a devastating progressive destructive infection of subcutaneous tissue and fascia, is a surgical emergency with a high mortality and morbidity. To analyze the location of necrotizing fasciitis, mode of presentation, microbiological characteristics, comorbid conditions, morbidity and mortality, records were reviewed retrospectively of all ninety-five patients admitted with necrotizing fasciitis to the surgical intensive care unit of Hamad General Hospital between January 1995 and February 2005. Fifteen patients died (15.1%). All patients had leucocytosis and fever on admission with a mean SOFA score varying from 8 to 10.3 according to the type of necrotizing fasciitis involved (Type 1 or 2) and the regions affected. All received aggressive fluid replacement therapy and all underwent debridement at least twice. The most common comorbid condition was Diabetes mellitus. Type 1 necrotizing fasciitis was common in gluteal, cervical and perineal regions; Type 2 was common in chest, axilla, leg and foot regions. Necrotizing fasciitis of the chest, axilla and gluteal regions had the highest mortality while necrotizing fasciitis of the perineum and genitalia had the lowest mortality.

Key words: Axilla, Chest, Cervical, Diabetes Mellitus, Gluteal, Forearm, Necrotizing Fasciitis

Introduction:

Necrotizing fasciitis, so named by Wilson in 1952⁽¹⁾ and first described by Meleney in 1924 in China⁽²⁾, is a relatively uncommon soft tissue infection characterized by rapidly progressing necrosis of subcutaneous tissue and fascia. It is frequently accompanied by moderate to severe systemic toxicity

and is rapidly fatal if not diagnosed early and treated properly. It is divided into Type 1 which is polymicrobial involving Non-Group A streptococci plus anaerobes and /or facultative anaerobes, and Type 2 which is mono-bacterial involving streptococci alone or in combination with staphylococci. Type 1 occurs commonly in abdominal and perineal areas whereas Type 2 occurs mostly in the extremities⁽³⁾. Previously synonyms for necrotizing fasciitis included hospital gangrene, suppurative fasciitis and flesh eating bacteria. In the literature there are few publications about the regions involved and the morbidity and mortality of this disease.

The aim of this study was to analyze location, presentation, microbiological characteristics, comorbid conditions, morbidity and mortality of this uncommon surgical emergency.

Patients and Methods:

The medical records of ninety-nine patients who had been treated for necrotizing fasciitis at our Surgical Intensive Care Unit (SICU) between January 1995 to February, 2005 were reviewed retrospectively. The diagnosis of necrotizing fasciitis had been confirmed by histopathology. The variables examined were age, gender, location of infection, type of infection, predisposing factors, comorbid conditions, severity of the disease, surgical treatment, resuscitation in first 24 hours and outcome in terms of survival of these patients. The statistical analyses were performed with SPSS statistical software.

Results:

Table 1 shows the demographic data of the ninety-nine patients; 38% of the cases in the leg and foot group were older than 60 years while 57.1% of arm, forearm, and hand necrotizing fasciitis patients were younger than 45 years. The mean age of chest, flanks and axilla necrotizing fasciitis was 40 ± 15.3 years and that of leg and foot group was 51.8 ± 19 years. Males outnumbered females in all groups. The chest, flanks and axilla necrotizing fasciitis patients did not have any comorbid condition but 45% of thigh, 80% of perineum and 60% cervical necrotizing fasciitis patients had diabetes mellitus (NIDDM). Other comorbid conditions associated were coronary artery disease (CAD) and hypertension (HTN).

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Possible predisposing factors for the necrotizing fasciitis (NF) are given in detail in **Table 1** including trauma, surgical procedures and insect bites, with surgical procedures being an important factor in 60% of those with cervical lesions. All patients presented with fever and leucocytosis and most, from all groups, had received non-steroidal anti-inflammatory drugs (NSAIDs).

Duration of symptoms varied from 2.2" 1.2 days (patients with NF in thigh) to 7.8" 8.2 days (cervical NF). Mean sequential organ failure assessment (SOFA) score on admission to the intensive care unit (ICU) was 10.3" 4.8 in chest, flanks and axilla patients, 9.1" 4.2 in thigh patients, 8.8" 3.6 in cervical, 8.4" 4.5 in perineum, 8.0" 5.1 in leg and foot necrotizing fasciitis patients.

During the first 24 hours after admission to the intensive care unit (ICU) patients in the leg and foot necrotizing fasciitis group received 4.7" 2.1 liters of fluid, 1.4" 2.4 units packed red blood cells (PRBC), 2.8" 4.7 units fresh frozen plasma (FFP) and 1.6" 5.2 unit of platelet concentrate whereas the chest, flanks and axilla necrotizing fasciitis group received 6.6" 2.1 liters of fluid, 5.0" 3.5 unit of PRBC, 8.8" 5.2 unit of FFP and 3.8" 7.4 units of platelet concentrate.

The mean days intubated for chest, flanks and axilla patients was 8.9" 7.6 days, 5" 6.2 days in leg and foot patients, 5.2" 4.3 days in thigh and 3.7" 3.1 days in patients with necrotizing fasciitis of perineum and genitalia. The mean ICU stay for a chest, flanks and axilla patient was 10.5" 7.4 days, 8.3" 12 days for leg and foot patients, 8.3" 5.3 days for thigh patients, 5.8" 3.9 days for perineum and genitalia patients and 6.4" 5.2 days for cervical necrotizing fasciitis patients (**Table 2**).

Type 2 NF occurred in 54.8% of patients in leg and foot, 55.0% thigh, 87.5% chest, flanks and axilla and 71.4% of arm, forearm and hand. Type 1 NF occurred in 95% of patients in perineum and genitalia, 87.5% gluteal and hip and 60% of cervical region. Multi-Organ Dysfunction Syndrome (MODS) occurred in 71.4% of arm, forearm and hand patients, 65.5% of chest, flanks and axilla patients, 60% of cervical patients, 55% of thigh patients, 41.9% of leg and foot patients, 37.5% of perineum and genitalia patients. The mortality was highest in patients with necrotizing fasciitis of chest, flanks and axilla, gluteal and hip (25%), then 20% in cervical NF, 19.4% in leg and foot necrotizing fasciitis, 10% in thigh and perineum and genitalia patients.

Discussion:

Necrotizing fasciitis is a devastating, rare, rapidly progressing infection, primarily involving fascia and subcutaneous tissue. It is the most severe form of soft tissue infection and is potentially limb and life threatening. Since Meleney's time the mortality associated with this condition has remained high with

a reported cumulative mortality rate of 34% (6%-76%)⁽⁴⁾.

In our study males outnumbered females suffering from necrotizing fasciitis but this infection is known to be more common in males⁽⁵⁾. With the exception of patients with necrotizing fasciitis of chest, flanks and axilla, who did not have any comorbid or systemic disease, most of the patients had comorbid diseases, such as diabetes mellitus, which rendered them susceptible to infections. Diabetics have a high glucose level that provides a rich substrate for bacterial growth in an environment of low oxygen tension⁽⁶⁾.

Patients with necrotizing fasciitis often have some predisposing history of trauma, operative procedure, insect bite, scratch or abrasion⁽⁷⁾. In our study, patients with leg, foot, arm, forearm and hand fasciitis had suffered trauma whereas two patients of chest, flanks and axillary necrotizing fasciitis had an insect bite as a predisposing factor. Many of our patients had received NSAIDs initially; these tend to mask the severity of the disease leading to late presentation with a much more severe form⁽⁸⁾. At admission all our patients were febrile with leucocytosis (**Table 2**). Recently published laboratory indicators for the diagnosis of necrotizing fasciitis (LRINEC score) give leucocytosis as one indicator by which necrotizing fasciitis can be diagnosed early, as well as providing a prognosis⁽⁹⁾.

Aggressive debridement is another factor that decides the outcome of this surgical emergency. All our patients were managed aggressively and underwent debridement at least twice. Their mean SOFA score was high (8 and above) indicating the need for admission to ICU and the severity of the disease⁽¹⁰⁾. These patients were given at least 4.5 liters of fluids, blood and blood products in the first 24 hours as they had probably lost a lot of fluid in edematous wound tissue, may have had capillary leakage and may even have had hemolysis with coagulation disorders⁽¹¹⁾.

Ninety-five percent of perineum and genitalia, 87.5% of gluteal, 60% of cervical necrotizing fasciitis were type 1. It is mentioned in the literature that polymicrobial necrotizing fasciitis in these regions is common^(12,13). Fifty-five percent of thigh, 54.8% of leg and foot, 87.5% of chest and axilla and 71.4% of arm, forearm and hand infection were Type 2 necrotizing fasciitis. Kun-chung et al in their study reported that Type 2 necrotizing fasciitis was common in the extremities⁽¹⁴⁾. Seventy-one per cent of patients with necrotizing fasciitis of the arm, forearm and hand, and 65.5% of patients with necrotizing fasciitis of chest, flanks and axilla patients had multi-organ dysfunction, possibly related to the type of necrotizing fasciitis, as mentioned by Kaul et al where more than fifty percent of patients with type 2 necrotizing fasciitis presented with toxic shock syndrome and multi-organ dysfunction⁽¹⁵⁾.

The overall mortality in our patients was 15.1%, the highest

Table 1: Age, gender, comorbidities, complications and outcome in various groups.

Variables	Leg/foot	Thigh	Perinium/ Genitalia	Chest/flanks/ axilla	Gluteal/hip	Arm/forearm/ hand	Cervical
Age (years)*	51.8" 19.0	49.6" 14.2	47.4" 12.2	40.0" 15.3	50.1" 1.2	45.1" 2	41.2" 14.8
Gender							
Male	25(80.6)	12(60.0)	15(75.0)	6(75.0)	7(87.5)	5(71.4)	4(80.0)
Female	6(19.4)	8(40.0)	5(25.0)	2(25.0)	1(12.5)	2(28.6)	1(20.0)
Comorbid Conditions							
NIDDM	19(16.3)	9(45.0)	16(80.0)	0(0.0)	6(75.0)	2(28.6)	3(60.0)
CAD	6(19.4)	4(20.0)	3(15.0)	0(0.0)	2(25.0)	1(14.3)	0(0.0)
HTN	9(29.0)	2(10.0)	8(40.0)	0(0.0)	4(50.0)	2(28.6)	0(0.0)
Predisposing Factors							
History of operation	1(3.2)	2(10.0)	3(15.0)	0(0.0)	3(37.5)	1(14.3)	3(60.0)
History of trauma	3(9.7)	5(25.0)	2(10.0)	1(12.5)	0(0.0)	1(14.3)	0(0.0)
History of insect bite	0(0.0)	0(0.0)	0(0.0)	2(25.0)	0(0.0)	0(0.0)	0(0.0)
History of NSAID	11(35.5)	18(90.0)	10(50.0)	7(87.5)	0(0.0)	3(42.9)	4(80.0)
Type							
Type 1	14(45.2)	9(45.0)	19(95.0)	1(12.5)	7(87.5)	2(28.6)	3(60.0)
Type 2	17(54.8)	11(55.0)	1(5.0)	7(87.5)	1(12.5)	5(71.4)	2(40.0)
MODS							
Yes	13(41.9)	11(55.0)	8(40.0)	5(65.5)	3(37.5)	5(71.4)	3(60.0)
No	18(58.1)	9(45.0)	12(60.0)	3(37.5)	5(62.5)	2(28.6)	2(40.0)
Outcome							
Died	6(19.4)	2(10.0)	2(10.0)	2(25.0)	2(25.0)	0(0.0)	1(20.0)
Survived	25(80.6)	18(90.0)	18(90.0)	6(75.0)	6(75.0)	7(100.0)	4(80.0)

Table 2: Severity, ICU stay, fluid, blood and blood products needed in first 24 hours.

Variables	Leg/foot	Thigh	Perinium/ Genitalia	Chest/flanks/ axilla	Cervical
	Mean" SD	Mean" SD	Mean" SD	Mean" SD	Mean" SD
WBC on admission ($10^3/\text{mm}^3$)	19.5" 9.9	20.2" 10.8	18.3" 5.0	17.0" 10.6	7.1" 7.0
Temperature °C	37.6" 2.4	38.2" 1	37.5" 1.4	38.7" 1.1	38.2" 1.3
Number of debridement	1.9" 1.2	2.1" 1.2	2.0" 0.8	4.3" 3.4	2.0" 1.0
SOFA score	8.0" 5.1	9.1" 4.2	8.4" 4.5	10.3" 4.8	8.8" 3.6
Duration of symptoms (days)	3.5" 2.1	2.2" 1.2	3.2" 2.0	5.9" 6.7	7.8" 8.2
Fluid required for 1st 24 hrs (litres)	4.7" 2.1	5.0" 1.9	4.6" 2.0	6.6" 2.1	5.8" 3.0
Number of pack Red blood cells received for 1st 24 hrs	1.4" 2.4	2.0" 1.5	2.4" 1.4	5.0" 3.5	2.0" 1.4
Number of fresh frozen plasma received for 1st 24 hrs	2.8" 4.7	3.9" 3.1	4.1" 3.4	8.8" 5.2	4.8" 3.6
Number of platelets concentrate received for 1st 24 hrs	1.6" 5.2	1.8" 4.9	1.1" 4.6	3.8" 7.4	3.0" 4.5
Intubated days	5" 6.2.0	5.2" 4.3	3.7" 3.1	8.9" 7.6	5.2" 5.1
ICU stay (days)	8.3" 12	8.3" 5.3	5.8" 3.9	10.5" 7.4	6.4" 5.2

mortality (25%) being in patients with necrotizing fasciitis of chest, flanks, axilla and gluteal region; again probably related to the amount of tissue necrosis and severity of the disease on admission. The mortality in leg and foot necrotizing fasciitis was 19.4%, in thigh 10% and no mortality in those with necrotizing fasciitis of arm, forearm and hand, which is less than reported previously⁽¹⁴⁾. The mortality in patients with perineum and genitalia necrotizing fasciitis was 10%, in contrast to reports in the literature of 20 % mortality⁽¹³⁾. In our patients with cervical necrotizing fasciitis the mortality was 20%

compared to the 37.5% mortality reported by Helmy et al⁽¹¹⁾.

Conclusion:

Diabetes mellitus was the most common comorbid disease associated with necrotizing fasciitis. Type 1 necrotizing fasciitis was common in gluteal, cervical and perineum regions. Type 2 necrotizing fasciitis was common in chest, axilla, leg and foot region. Necrotizing fasciitis in the chest, axilla and gluteal regions had the highest mortality, while perineum and genitalia necrotizing fasciitis had the lowest mortality.

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